IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

In re the Application

Inventor	**:**	**Redert et al.**
Application No.	**:**	**10/542,137**
Filed	**:**	**July 12, 2005**
For	**:**	**Full Depth Map Acquisition**

APPEAL BRIEF

On Appeal from Group Art Unit 2625

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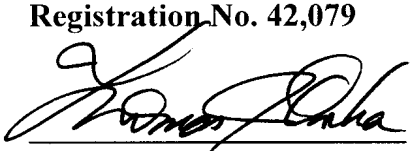

Date: November 16, 2009

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I. REAL PARTY IN INTEREST

The real party in interest is the assignee of the present application, Koninklijke Philips Electronics N.V., and not the party named in the above caption.

II. RELATED APPEALS AND INTERFERENCES

With regard to identifying by number and filing date all other appeals or interferences known to Appellants which will directly effect or be directly affected by or have a bearing on the Board's decision in this appeal, Appellants are not aware of any such appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-10 and 12 have been presented for examination. All of these claims are pending, stand finally rejected, and form the subject matter of the present appeal.

IV. STATUS OF AMENDMENTS

In response to the Final Office Action, dated June 16, 2009, Appellants timely submitted, on August 11, 2009, arguments believed to overcome the reasons for rejecting the claims. The only amendment contained in the August 11, 2009 filing was an attempt to correct the numbering of claim 12, in response to the objection in paragraph 3 of the

June 16, 2009 Final Office Action, which recited: "it appears to the examiner that claim 12 should have been numbered as claim 11." On February 12, 2008, an Advisory Action was entered into the record. The Advisory Action stated that the amendment would not be entered and that the response did not place the application in a condition for allowance. The Advisory Action in addition provided further rationale for maintaining the rejection of the claims under 35 USC §102(e). A Notice of Appeal was timely filed in response to the Advisory Action and this Appeal Brief is being filed within the period of response from the date of the Notice of Appeal.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention is expressed primarily in independent claims 1 and 12. Claim 1 recites a method for acquiring a substantially complete depth map from a 3-D scene. The method comprising the steps of: a) acquiring at least one image of said 3-D scene using less than three cameras (see paragraph [0033] of published application); b) acquiring partial depth map from said at least one image (item 8 of Fig. 1a and paragraph [0032]); c) acquiring derivates of depth information from said at least one image (see paragraph [0036]); and d) extending said partial depth map by adding non-relevant information to said partial depth map, creating a pixel dense full depth map being spatially consistent with both said partial depth map and said derivates of depth information (see paragraphs [0037] and [0039]).

Independent claim 12 recites a system for acquiring a substantially complete depth map from a 3-D scene. The system comprises: a) less than three cameras for acquiring at least one image of said 3-D (see paragraph [0033]); and, b) an integrated circuit for providing image processing of said at least one image, said integrated circuit comprising: c) acquiring partial depth map from said at least one image, d) acquiring derivates of depth information from said at least one image, and e) extending said partial depth map by adding non-relevant information to said partial depth map, creating a pixel dense full depth map being spatially consistent with both said partial depth map and said derivates of depth information. (see paragraph [0027] where the "pre-described method" is the method recited in claim 1.

The remaining claims, which depend from independent claim 1, express further aspects of the invention.

VI. GROUNDS FOR REJECTION TO BE REVIEWED ON APPEAL

The issue in the present matter is whether:

1. Claims 1-10 and 12 are anticipated under 35 USC 102(e) by Medioni et al., U.S. Patent No. 7,103,211 (Hereinafter, "Medioni").

VII. ARGUMENT

I. 35 USC §102(e) Rejection of Claims 1 and 12

Claims 1 and 12 are not anticipated by Medioni under 35 USC 102(e), as Medioni fails to show material elements recited in the independent claims.

Appellants respectfully submit that the pending claims are patentable for at least the following reasons.

Claim 1 recites the limitations of:

> Method for acquiring a substantially complete depth map from a 3-D scene with the steps of:
> a) acquiring at least one image of said 3-D scene using less than three cameras,
> b) acquiring partial depth map from said at least one image,
> c) acquiring derivates of depth information from said at least one image,
> d) extending said partial depth map by adding non-relevant information to said partial depth map, creating a pixel dense full depth map being spatially consistent with both said partial depth map and said derivates of depth information.

As noted in the Final Office Action, Medioni discloses a method for generating 3D face models from one camera. The Office Action submits that the limitation of the "a) acquiring at least one image of said 3-D scene using less than three cameras" step of claim 1 is taught by Medioni in col. 7, lines 8-10 and Fig. 1. Appellants respectfully disagree. Although Medioni teaches the use of one camera, clearly, this feature of

Medioni significantly differs from the invention as defined by claim 1 where a partial depth map is acquired from an image and not a sequence of image frames of a head in motion (i.e., moved from one direction to another). Moreover, the claim is directed to and specifically recites acquiring images of a scene. Successive images of a head in motion are thus outside the language of the claim.

It should be noted how the invention describes its functionality with respect to a user viewing a scene and how human perception with respect to such still images is utilized in the invention:

> [0006] One major focus of 3-D image processing is structure from motion retrieval, which is a quantitative method and relies on motion within the image, thus will not be applicable to still images [emphasis added].
>
> [0007] Examples of qualitative algorithms are those that use occlusion semantics, e.g. by examining the dis- and reappearing of objects within a video, and so called T-junction analysis for still images.
>
> [0008] Both methods provide depth information which is incomplete. The quantitative method has an uncertainty interval, the qualitative method provides only depth ordering information.
>
> [0009] It is an object of the invention to provide a method for 3-D image acquisition which provides full 3-D depth maps from partial depth maps. It is a further object of the invention to provide a method for 3-D image acquisition, which takes human perceptual constraints for processing into account.

Claim 1 also recites the feature "b) acquiring partial depth map from said at least one image". The Final Office Action submits that this limitation is taught by Medioni in col. 5, lines 13-32. Appellants respectfully disagree. In this section, Medioni again teaches that two adjacent views of the sequence of image frames of a head in motion are used as part of a two stage process. Images of a head in motion are not the same as one or more images of **a** 3-D scene. This is not just a matter of semantics, although appellants submit that semantics alone would suffice to distinguish claim 1 from Medioni and overcome the 35 U.S.C. §102(e) rejection. As noted above (in particular, [0006]), the invention's method of acquiring a substantially complete depth map from a 3-D scene as recited in claim 1 requires additional analysis than the quantitative method employed in analyzing a head in motion.

A claim is anticipated only if each and every element recited therein is expressly or inherently described in a single prior art reference. Medioni cannot be said to anticipate the present invention, because Medioni fails to disclose each and every element recited. As shown, Medioni, inter alia, fails to disclose the method of claim 1 for acquiring a substantially complete depth map from a 3-D scene which comprises the steps of a) acquiring at least one image of said 3-D scene using less than three cameras, and b) acquiring partial depth map from said at least one image. Claim 12 recites similar features and is deemed not to be anticipated by Medioni for at least the same reasons.

Having shown that Medioni fails to disclose each and every element claimed, appellants submit that claims 1 and 12 are allowable over Medioni.

II. 35 USC §102(e) Rejection of Claims 2-10

With regard to the remaining dependent claims 2-10, these claims ultimately depend from independent claim 1. Appellants respectfully submit that these remaining dependent claims are allowable at least for their dependence upon an allowable base claims.

VIII. CONCLUSION

In view of the above analysis, it is respectfully submitted that the referenced teaching fails to render unpatentable or anticipate the subject matter of any of the present claims. Therefore, reversal of all outstanding grounds of rejection is respectfully solicited.

Respectfully submitted,
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VIII. CLAIMS APPENDIX

The claims which are the subject of this Appeal are as follows:

1. Method for acquiring a substantially complete depth map from a 3-D scene with the steps of:
a) acquiring at least one image of said 3-D scene using less than three cameras,
b) acquiring partial depth map from said at least one image,
c) acquiring derivates of depth information from said at least one image,
d) extending said partial depth map by adding non-relevant information to said partial depth map, creating a pixel dense full depth map being spatially consistent with both said partial depth map and said derivates of depth information.

2. Method according to claim 1, characterized in that said non-relevant information extending said depth map is calculated by maximizing a probability function containing said non-relevant information, said partial depth map and said derivates of said depth map.

3. Method according to claim 1, characterized in that said partial depth information and said derivates of depth information is acquired by quantitative image processing.

4. Method according to claim 1, characterized in that said partial depth information is acquired by detecting a local amount of image texture, and determining depth from spatially high textured areas.

5. Method according to claim 1, characterized in that said partial depth information and said derivates of depth information is acquired by qualitative image processing.

6. Method according to claim 1, characterized in that said partial depth information is acquired by object segmentation to determine objects within said at least one image and

by detecting the ordering of objects.

7. Method according to claim 1, characterized in that human depth perception is modeled by depth sensors and that said pixel dense full depth map is calculated based on properties of said depth sensors.

8. Method according to claim 1, characterized in that said pixel dense full depth map is calculated by perturbating pixel values not defined by said partial depth map and said derivates of said depth map and minimizing said probability function.

9. Integrated circuit providing image processing of said at least one image according to claim 1.

10. Use of a method according to claim 1 in consumer electronics, television and computer vision products.

12. System for acquiring a substantially complete depth map from a 3-D scene, the system comprising:
a) less than three cameras for acquiring at least one image of said 3-D; and,
b) an integrated circuit for providing image processing of said at least one image, said integrated circuit comprising:

c) acquiring partial depth map from said at least one image,

d) acquiring derivates of depth information from said at least one image, and

e) extending said partial depth map by adding non-relevant information to said partial depth map, creating a pixel dense full depth map being spatially consistent with both said partial depth map and said derivates of depth information.

X. EVIDENCE APPENDIX

No further evidence is provided.

XI. RELATED PROCEEDING APPENDIX

No related proceedings are pending and, hence, no information regarding same is available.